

## SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F21-R-48

**Name:** Angostura Reservoir

**County:** Fall River

**Legal description:** Sec. 1-12, 17, 19, 20,21,28-33; T 8S, R 5,6 E

**Location from nearest town:** 7 miles southeast of Hot Springs, SD.

**Dates of present survey:** May 12-14, August 3-5, 2015

**Date last surveyed:** May 14-16, August 7, 11-13, 2014

**Management classification:** Warmwater permanent

Primary Species: (game and forage)

1. Walleye
2. Channel catfish
3. Smallmouth bass
4. Gizzard shad
5. Largemouth bass
6. Black crappie
7. Spottail shiner
8. Emerald shiner
9. \_\_\_\_\_

Secondary and other species:

1. Bluegill
2. Common carp
3. Green sunfish
4. Northern pike
5. Northern redhorse
6. River carpsucker
7. White sucker
8. Yellow perch
9. Freshwater drum

### PHYSICAL CHARACTERISTICS

**Surface Area:** 4,612 acres

**Watershed:** 5,824,000 acres

**Maximum depth:** 70 feet

**Mean depth:** 29.3 feet

**Lake elevation at survey (from known benchmark):** unknown

#### Ownership of lake and adjacent lakeshore property:

The U.S. Bureau of Reclamation performs the maintenance of Angostura Reservoir and Dam. The South Dakota Department of Game, Fish and Parks manages much of the adjacent land as recreation/campground area and as a Game Production Area. The local irrigation district controls the water level and irrigation releases.

#### Fishing Access

Angostura Reservoir has excellent access for boat and shore anglers. Seven boat ramps are located around the reservoir and a marina with store is located at the northeast corner of the lake. Shore anglers can access around the reservoir by paved roads and on the southern portion through two track trails.

#### Observations of Water Quality and Aquatic Vegetation

Department personnel identified no pollution problems during the 2015 survey. Submergent vegetation, curlyleaf pondweed and sago pondweed were observed in the bays and shallow water areas of Angostura. Emergent vegetation consisted of cattail and smartweed.

### **Observations on conditions of structures (i.e. spillway, boat ramps and docks, roads, etc)**

No apparent problems were identified on either the dam or spillway. The boat ramps and other facilities were in excellent condition.

### **MANAGEMENT OBJECTIVES**

**Objective 1.** To maintain a walleye fishery with a minimum gill net catch for stock-length (10 in) and longer of 20 per net, a PSD range of 30-60, PSD-P 10 or greater, and maintain a mean growth rate of no less than 35.5 cm (14 in) by age-3.

**Objective 2.** Maintain the gizzard shad population.

**Objective 3.** Maintain an angler satisfaction rate of 64.5% or greater.

### **BIOLOGICAL DATA**

#### **Sampling Effort and Catch**

##### *Adult Fish survey*

Trap nets were used on May 12-14 and experimental gill nets on August 3-5, 2015 to sample adult fish populations in the reservoir (Figure 1). The net sampling consisted of eight trap net nights and four gill net nights, catch data is displayed in Tables 1 and 2. Discussion on selected fish species follows and completes this report.

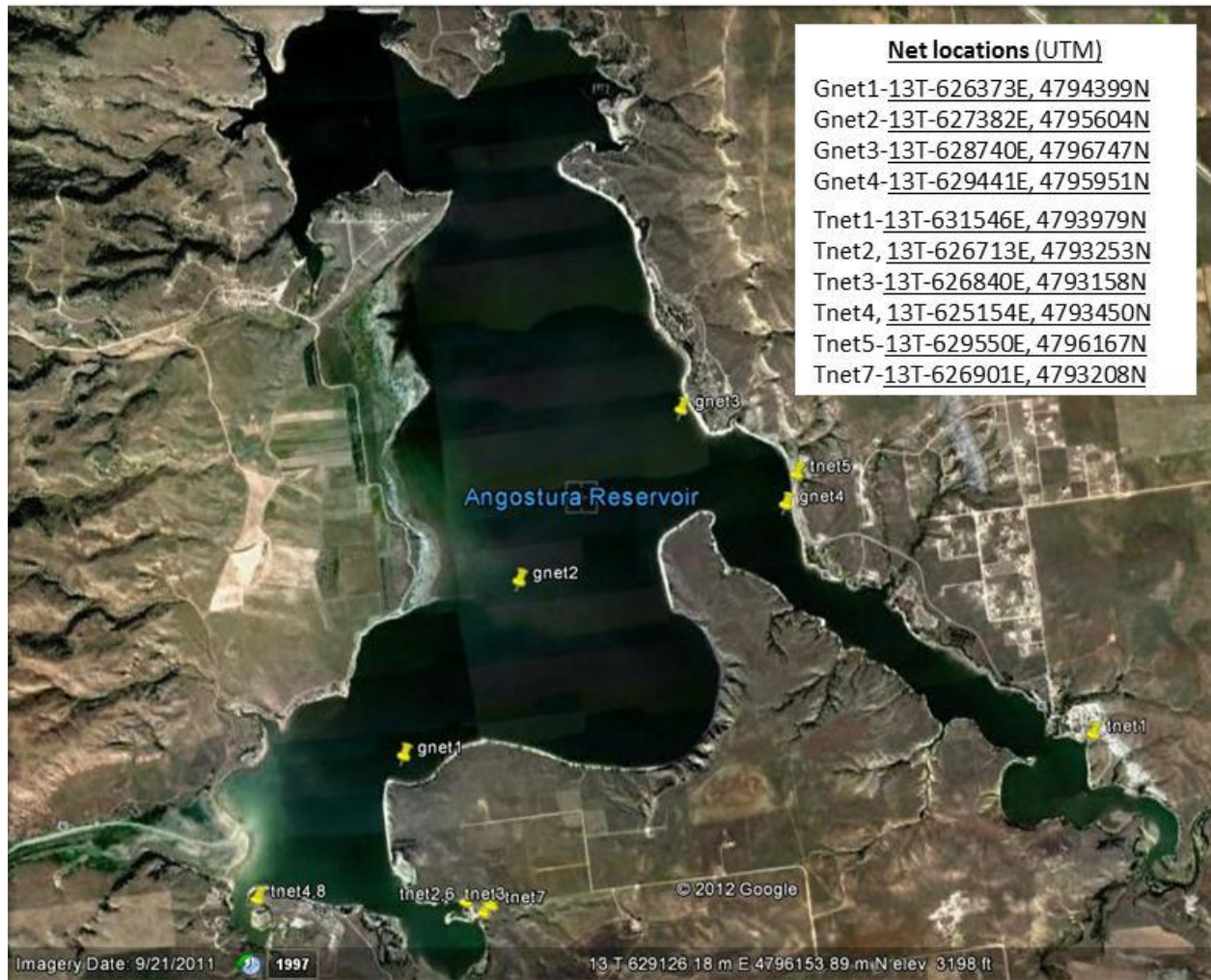


Figure 1. Locations, including GPS coordinates, of experimental gill (gnet) and trap (tnet) nets during the fisheries survey of Angostura Reservoir, Fall River County, 2015.

Table 1. Catch data from all species collected in eight trap nets in Angostura Reservoir, Fall River County, May 12-14, 2015. CPUE's with 80% confidence intervals in parentheses. PSD, PSD-P and *Wr* with 90% confidence intervals in parentheses.

Species	N	CPUE	CPUE-S	PSD	PSD-P	<i>Wr</i> >S
Black crappie	47	5.9 (3.6)	5.9 (3.6)	100 (--)	94 (6)	99.0 (0.8)
Bluegill	11	1.4 (1.2)	1.4 (1.2)	91 (17)	0 (--)	95.1 (1.8)
Channel catfish	4	0.5 (0.5)	0.3 (0.4)	--	--	78.9 (44.7)
Common carp	2	0.3 (0.4)	0.3 (0.4)	--	--	73.2 (--)
Rock bass	1	0.1 (0.2)	0.1 (0.2)	--	--	101.2 (--)
Shorthead redhorse	2	0.3 (0.4)	0.3 (0.4)	--	--	77.6 (--)
Walleye	10	1.3 (0.8)	1.3 (0.8)	100	80 (24)	79.8 (3.1)
White sucker	1	0.1 (0.2)	0.1 (0.2)	--	--	70.5 (--)
Yellow perch	1	0.1 (0.2)	0.0 (--)	--	--	--

Table 2. Catch data from all species collected in four gill nets in Angostura Reservoir, Fall River County, August 3-5, 2015. CPUE's with 80% confidence intervals in parentheses. PSD, PSD-P and *Wr* with 90% confidence intervals in parentheses.

Species	N	CPUE	CPUE-S	PSD	PSD-P	<i>Wr</i> >S
Black crappie	13	3.3 (1.4)	2.3 (1.4)	56 (33)	56 (33)	117.1 (8.8)
Channel catfish	100	25.0 (6.4)	8.8 (4.6)	11 (10)	0 (--)	87.0 (2.1)
Common carp	29	7.3 (3.4)	6.5 (3.4)	58 (17)	0 (--)	87.1 (0.9)
Freshwater drum	10	2.5 (1.7)	2.0 (1.5)	13 (23)	0 (--)	92.8 (0.4)
Gizzard shad	23	5.8 (1.7)	5.8 (1.7)	100 (--)	0 (--)	97.1 (1.7)
Northern pike	7	1.8 (0.8)	1.8 (0.8)	29 (35)	0 (--)	95.3 (1.9)
River carpsucker	8	2.0 (2.3)	2.0 (2.3)	100 (--)	100 (--)	94.1 (5.0)
Shorthead redhorse	19	4.8 (4.5)	4.8 (4.5)	100 (--)	26 (18)	89.4 (1.3)
Smallmouth bass	21	5.3 (5.1)	5.0 (5.2)	80 (16)	15 (14)	97.3 (2.1)
Spottail shiner	1	0.3 (0.4)	--	--	--	--
Walleye	123	30.8 (5.3)	28.0 (3.4)	58 (8)	14 (6)	92.0 (0.6)
White sucker	3	0.8 (0.8)	0.8 (0.8)	--	--	92.5 (4.1)
Yellow perch	63	15.8 (16.5)	3.0 (2.9)	8 (15)	0 (--)	94.3 (3.2)

### Black crappie

Trap net catch per unit effort (CPUE) was 5.9 (Tables 1 and 3), compared to 7.0 last year. Size structure showed a population dominated by large fish (Figure 2) with a proportional stock density (PSD) of 100 and of preferred-length stock density (PSD-P) of 94. This year size structure was similar to last year's PSD of 95 and a PSD-P of 68. Fish condition was good with a mean relative weight for stock length and larger fish (*Wr*>S) of 99.0 (Table 1).

Table 3. Composite listing of data for black crappie collected by trap nets in Angostura Reservoir 2011-2015. CPUE's with 80% confidence intervals in parentheses. PSD and PSD-P with 90% confidence intervals in parentheses.

Year	N	CPUE	PSD	PSD-P
2011	211	26.4 (15.4)	100 (1)	50 (6)
2012	32	4.0 (2.0)	94 (8)	31 (14)
2013	93	11.6 (5.9)	73 (8)	26 (8)
2014	56	7.0 (2.3)	95 (5)	68 (10)
2015	47	5.9 (3.6)	100 (--)	94 (6)

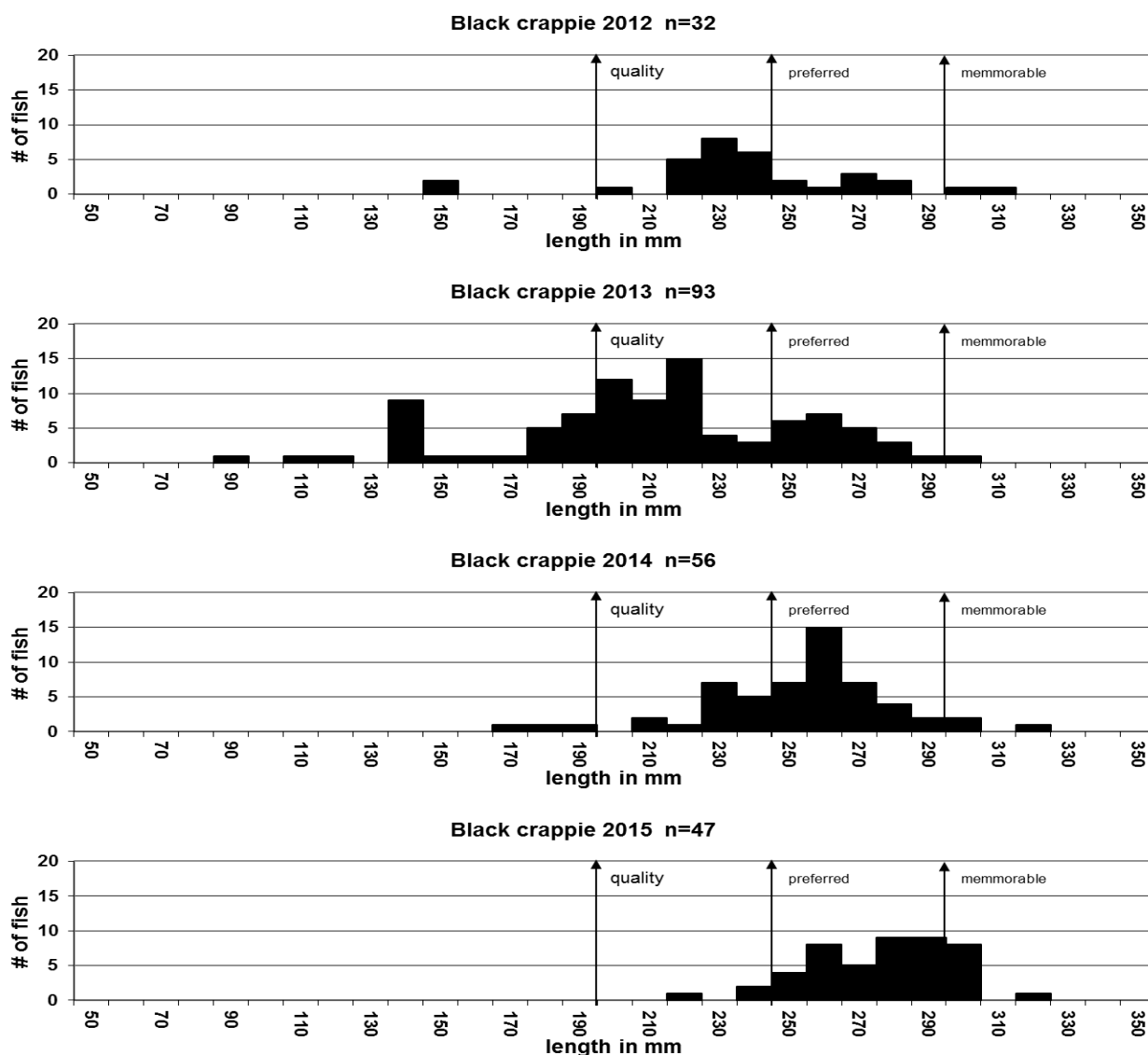


Figure 2. Length frequency histograms of black crappie collected by trap nets from Angostura Reservoir, Fall River County, 2012-2015.

## Channel catfish

Channel catfish were the second most abundant fish collected in gill nets (Table 2). Mean gill net CPUE for channel catfish was 25.0, and for fish stock length and greater catch (CPUE-S) was 8.8 (Table 4). Stock density indices remain low; PSD=11, PSD-P=0. Mean channel catfish  $W_{r>S}$  was 87.0. The length frequency histogram (Figure 3) shows fewer large fish compared to last year.

Table 4. Composite listing of data for channel catfish collected by gill nets in Angostura Reservoir 2009-2015. CPUE's with 80% confidence intervals in parentheses. PSD and PSD-P with 90% confidence intervals in parentheses.

Year	N	CPUE	CPUE-S	PSD	PSD-P
2009	137	34.3 (16.7)	26.5 (11.4)	2 (2)	0
2010	60	15.0 (5.3)	13.8 (5.1)	11 (7)	0
2011	120	30.0 (4.6)	24.0 (2.9)	21 (7)	0
2012	65	16.3 (8.0)	9.8 (5.4)	13 (9)	0
2013	114	28.5 (23.4)	13.5 (9.1)	15 (8)	0
2014	124	31.0 (8.0)	16.8 (6.0)	27 (9)	1 (3)
2015	100	25.0 (6.4)	8.8 (4.6)	11 (10)	0 (--)

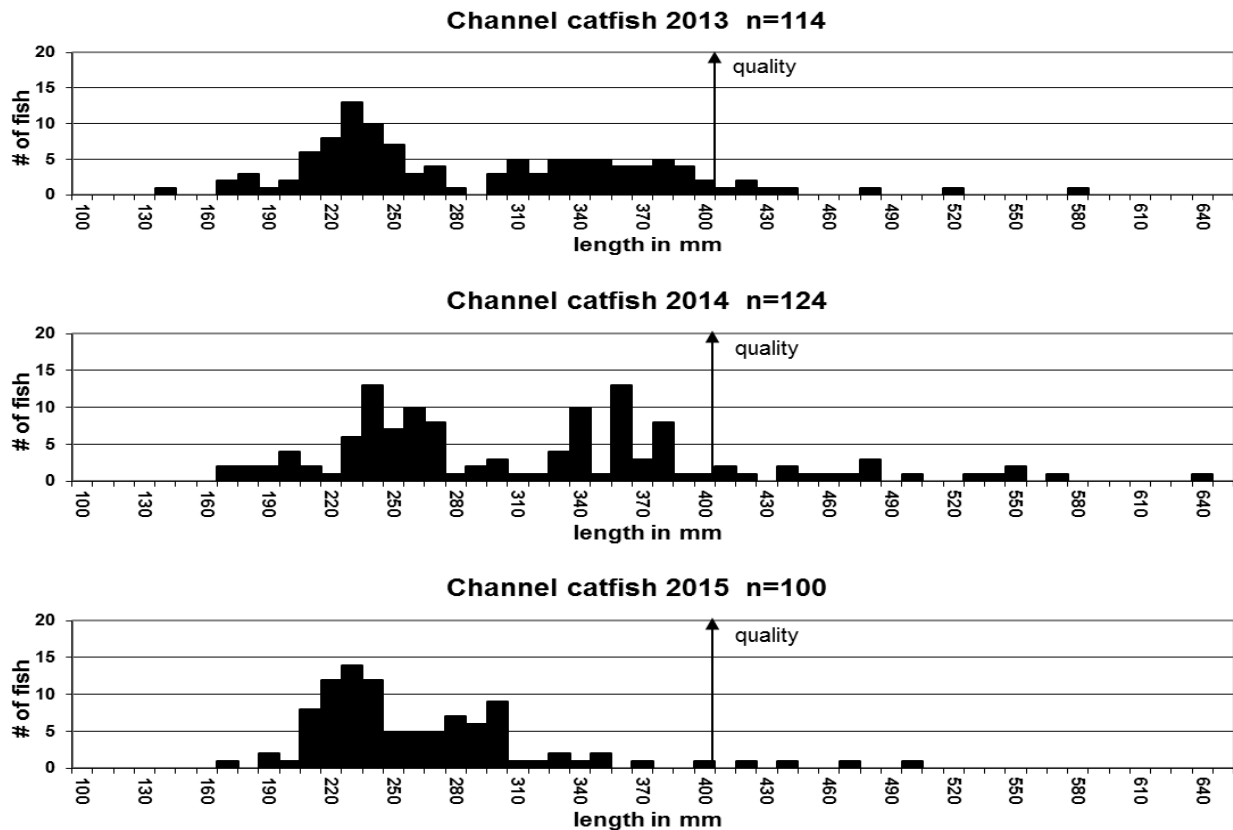


Figure 3. Length frequency histograms of channel catfish collected in experimental gill nets from Angostura Reservoir, Fall River County, 2013-2015.

### Gizzard shad

Gizzard shad were introduced to Angostura Reservoir in 1990 to provide additional forage for game fish, particularly walleye which were experiencing slow growth and low relative weights. The first age-0 gizzard shad were collected in 1994 during a ¼ arc seine survey, showing successful natural reproduction. No adult gizzard shad have been stocked in Angostura Reservoir since 1994.

The northern latitude of South Dakota and subsequent cold winter water temperatures likely causes some over-winter mortality of gizzard shad on an annual basis. Limited winter mortality of gizzard shad is desirable to keep densities of adults low, while maintaining high reproductive potential due to the high fecundity of the species. The continued presence of age-0 gizzard shad, indicate that adult survival is occurring, and often results in years of large reproduction. The length frequency histogram shows a large year class currently in the 320-360mm length class (Figure 4)

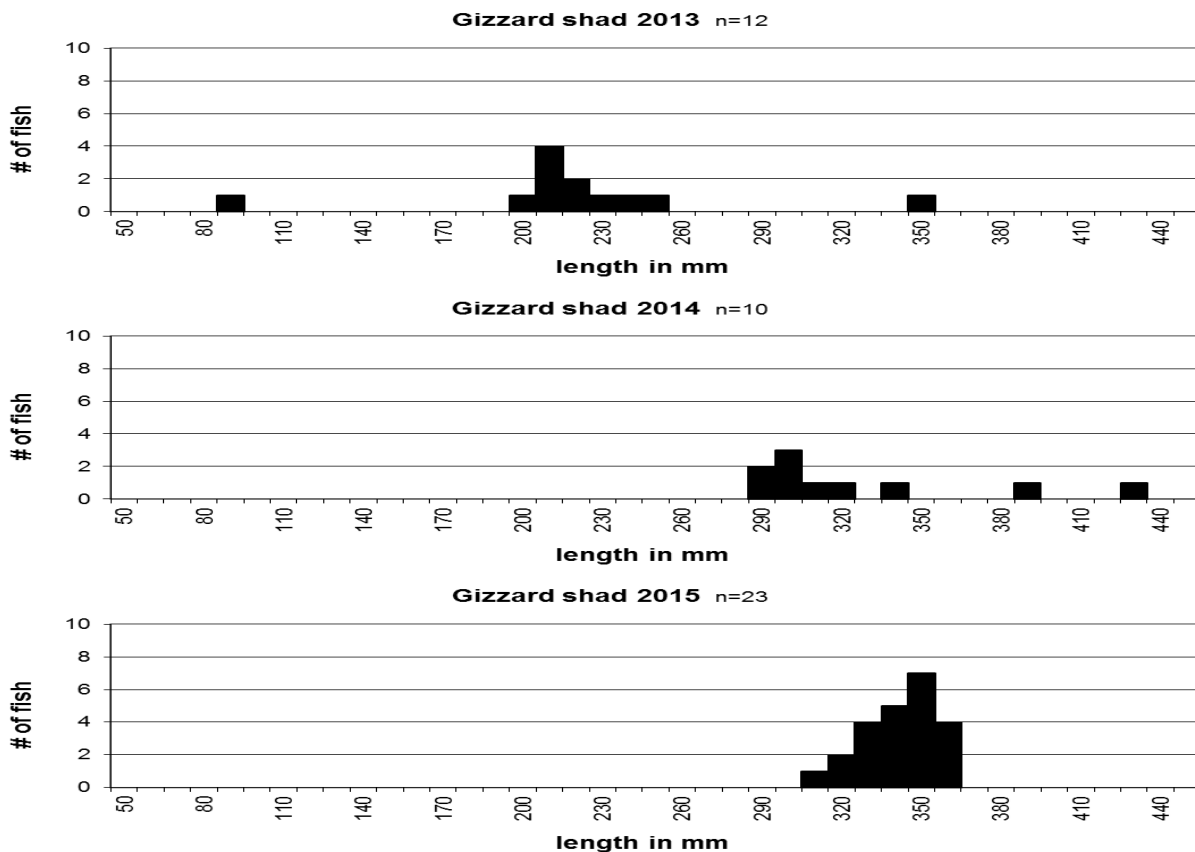


Figure 4. Length frequency histograms of gizzard shad collected in experimental gill nets from Angostura Reservoir, Fall River County, 2013-2015.

### Smallmouth bass

Gill net CPUE for smallmouth bass was 5.3 (Table 2). Stock indices indicate a population dominated by larger fish with a PSD of 80 and a PSD-P of 15. Fish condition for stock length

and larger fish was 97.3. Growth was excellent with fish reaching 322 mm at age three (Table 5). Length frequencies show multiple year classes present in the system (Figure 6).

Table 5. Estimated age, minimum, maximum and weighted mean length (mm) at capture for smallmouth bass by otoliths from the Angostura Reservoir gill net sample, August 3-5, 2015

Age	Minimum length range @ capture	Weighted mean length @ capture	Maximum length range @ capture	N
1	129	129	129	1
2	242	281	300	11
3	310	322	339	5
4	347	347	347	1
5	393	393	393	1
7	402	402	402	1

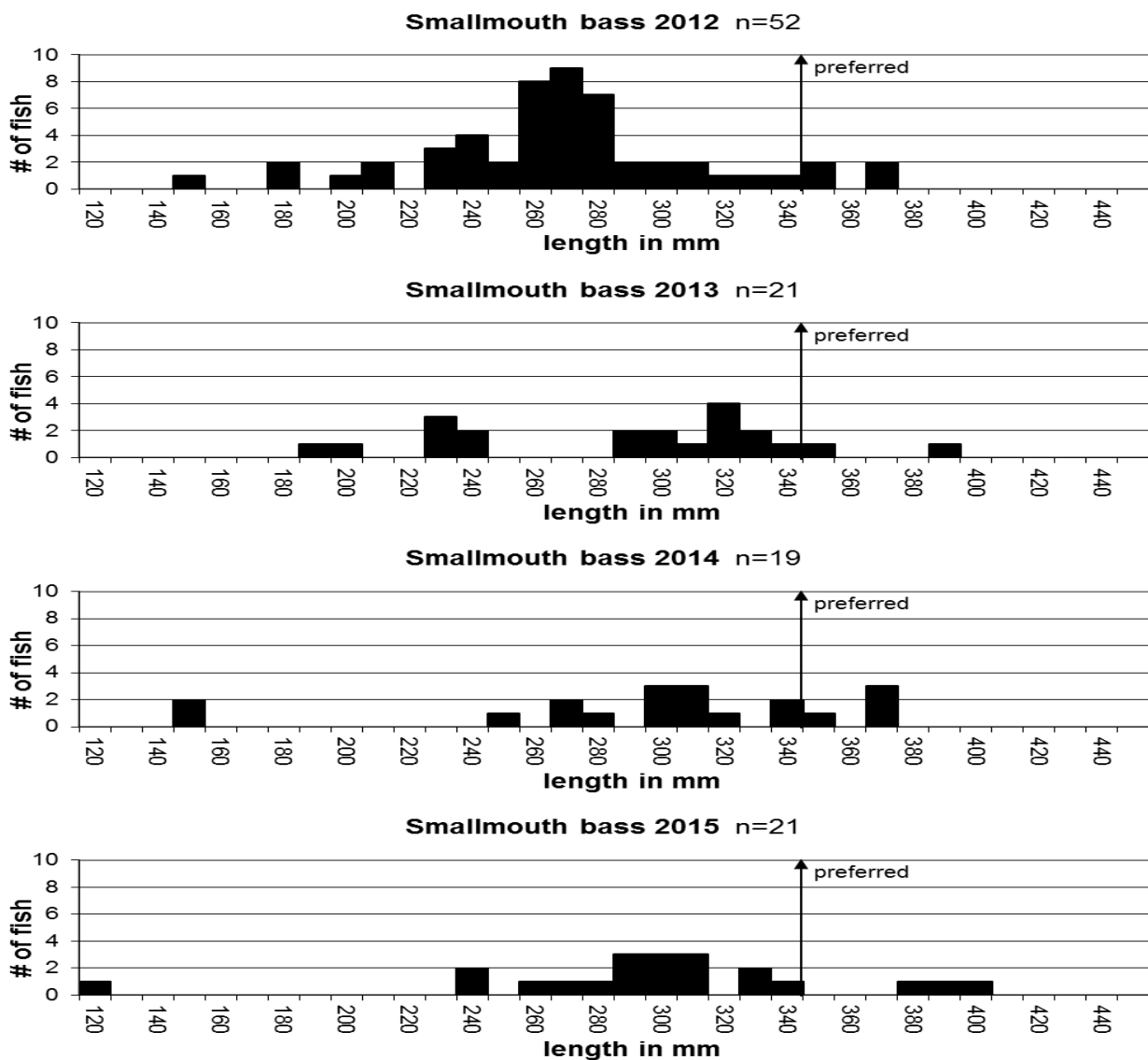


Figure 6. Length frequency histograms of smallmouth bass collected in experimental gill nets from Angostura Reservoir, Fall River County, 2012-2015.



## Walleye

Angostura Reservoir remains a popular walleye fishery in western South Dakota. Despite high fishing pressure, walleye abundance remains good with a gill net CPUE of 30.8 (Tables 2 and 6). Catch rates have been similar the past four years. The 2005 lake management plan sets the target CPUE for stock length and longer walleye to be at least 20 per gill net, which is where it is at most years. Sizes of fish and condition have also remained stable over the past few years with only small changes. The past seven years fall within the current management objective of PSD between 30 and 60. Fish over 20 inches increased slightly this year yielding a PSD-P of 14, compared to 6 last year. Walleye condition was higher with a 2015 mean  $W_{r \geq S}$  of 92.0, in 2014 the mean was 84.6 (Table 6). Growth continues to look excellent with fish surpassing 15 inches between age-2 and age-3 (Table 7). The length frequency histogram resembles a balanced population with several strong year classes present (Figure 7). It also shows excellent recruitment.

Table 6. Composite listing of data for walleye collected by gill nets in Angostura Reservoir 2006-2015. CPUE's with 80% confidence intervals in parentheses. PSD, PSD-P and  $W_{r \geq S}$  with 90% confidence intervals in parentheses.

Year	N	CPUE	CPUE-S	PSD	PSD-P	$W_{r \geq S}$
2006	98	24.5 (6.8)	23.3 (6.0)	27 (8)	3 (3)	82.8 (0.1)
2007	82	20.5 (4.0)	20.5 (4.0)	23 (8)	5 (4)	83.3 (0.7)
2008	123	41.0 (10.9)	39.0 (10.9)	65 (7)	2 (2)	84.7 (0.1)
2009	88	22.0 (2.3)	21.8 (2.4)	53 (9)	8 (5)	86.0 (0.7)
2010	94	23.5 (6.1)	21.5 (4.8)	53 (9)	6 (4)	83.3 (0.4)
2011	71	17.8 (7.0)	16.5 (6.4)	70 (10)	9 (6)	84.8 (0.2)
2012	86	21.5 (9.1)	20.0 (8.1)	48 (10)	6 (5)	87.7 (0.8)
2013	105	26.3 (9.5)	25.3 (8.8)	55 (9)	9 (5)	84.5 (0.5)
2014	136	34.0 (4.3)	29.5 (5.1)	59 (8)	6 (4)	84.6 (0.6)
2015	123	30.8 (5.3)	28.0 (3.4)	58 (8)	14 (6)	92.0 (0.6)

Table 7. Estimated age, minimum, maximum and weighted mean length (mm) at capture for walleye by otoliths from the Angostura Reservoir gill net sample, August 3-5, 2015.

Age	Minimum length range @ capture	Weighted mean length @ capture	Maximum length range @ capture	N
1	235	278	322	46
2	374	392	419	11
3	417	447	483	13
4	410	459	519	23
5	458	515	566	8
6	480	521	600	5
7	588	611	640	3
8	563	584	605	2
9	505	514	526	3
10	623	623	623	1

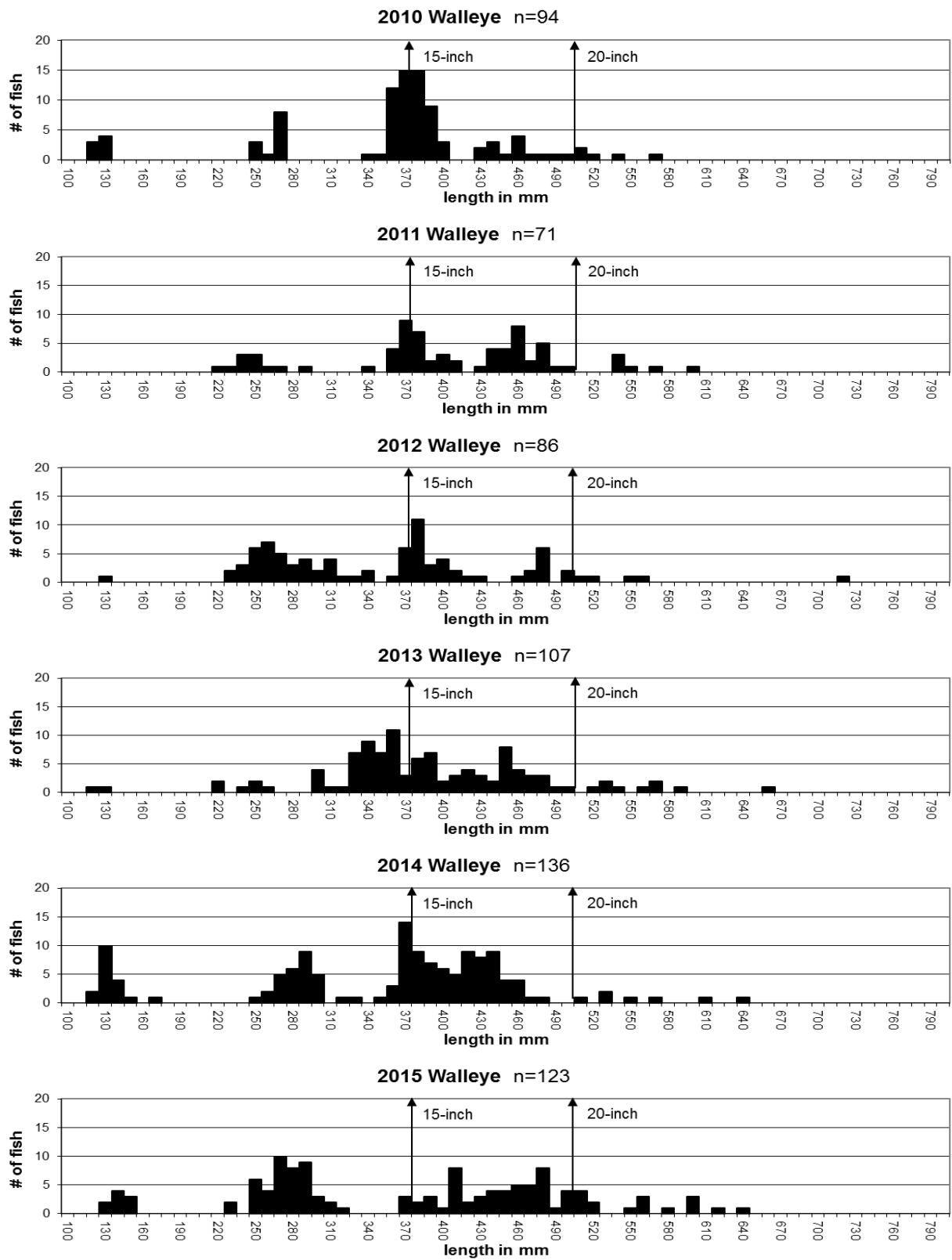


Figure 7. Length frequency histogram of walleye collected in experimental gill nets from Angostura Reservoir, Fall River County, South Dakota, 2010-2015.

## RECOMMENDATIONS

1. Continue conducting annual lake surveys to evaluate fish populations and regulation success.

## APPENDIX

Appendix A. Stocking history, including year a stocking occurred, number stocked, species and size of fish for Angostura Reservoir, Fall River County, South Dakota, 2000-2015.

Year	Number	Species	Size
2000	97,133	Rainbow trout	Fingerling
	207,779	Walleye	Fingerling
2001	12,638	Largemouth bass	Fingerling
	37,000	Rainbow trout	Fingerling
2002	50,100	Walleye	Fingerling
	30,000	Smallmouth bass	Fingerling
2003	218,791	Walleye	Fingerling
	80,000	Rainbow trout	Fingerling
2005	381,045	Walleye	Fingerling
2008	479,900	Walleye	Fingerling
2010	289,340	Walleye	Fingerling
2011	310,199	Walleye	Fingerling
2012	476,423	Walleye	Fingerling
2014	549,725	Walleye	Fingerling
2015	4,702,776	Walleye	Fry